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ABSTRACT

An interactive video trial involved teaching two Year-7 lessons to elementary school students in Queensland (Australia). French was taught to one class through two-way video and audio so that students and teachers could see and hear each other, and Japanese was taught simultaneously to three classes through one-way video and two-way audio. Evaluation was conducted through participant interviews with teachers and students at the five schools, and observation by seven staff members of the School of Education of the University of Central Queensland. Picture quality was considered excellent, but quality of sound was less satisfactory. Two-way video and audio was clearly preferred to one-way video with two-way audio. Orientation and training are necessary to ensure that the technology is accepted and used appropriately, but this form of interactive teaching and learning may prove a cost-effective addition to, or substitute for, some current educational practices. Potential applications include use in smaller and more isolated schools and the provision of key lessons to multiple or remote sites. Four appendixes contain the trial interview schedule and comments and draft reports from three evaluators. (SLD)

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A REPORT ON THE EFFECTIVENESS AND POTENTIAL OF AN INTERACTIVE VIDEO TEACHING TRIAL

A report on an interactive video teaching trial held in Rockhampton in March 1992. The trial was conducted by the Open Access Centre of the Queensland Department of Education in conjunction with the Capricornia Region of the Department of Education.

This report was compiled by Robert Baker, Ken Appleton, Robyn Cox, Patrick Danaher, Peter Hallinan, Bobby Harreveld, Pat Moran and Doug Wyer of the School of Education and Research Centre for Open and Distance Learning at the University of Central Queensland.

April 1992

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A REPORT ON THE EFFECTIVENESS AND POTENTIAL OF AN INTERACTIVE VIDEO TEACHING TRIAL

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SUMMARY

The trial involved teaching two Year 7 lessons from a temporary studio in Rockhampton. One lesson, French, was taught using two-way video and audio to a single class at a local school. The second lesson, Japanese, was taught using one-way video and two-way audio to classes in three local schools.

The trial technology employs amateur service frequencies transmission which has very significant cost savings compared with alternative interactive systems. The principal limitation of the technology is its restricted range, some 50-150km depending on topography, although this can be extended through use of repeaters.

Reactions to the trial, as detailed in this report, are generally very positive and give a strong basis and mandate for further trials. Specifically,

The quality of the picture was regarded as excellent, and as comparable to that of broadcast television.

The quality of sound was less satisfactory both in clarity and as a result of use of hand held microphones. Difficulties in these areas are expected to be resolved speedily and without significant cost increases.

It is apparent that two-way video and audio is preferable to one-way video and two-way audio, although the latter still represents a very significant advance on current teleconferencing procedures.

Orientation and training programs are essential if the technology is to be accepted and used appropriately.

Future trials need to vary teaching and learning situations (content and pedagogy, year level, purpose, setting and group sizes) as well as permutations of the technology in order to assess feasible and optimal usage patterns and levels.

The present trial, and the apparent potential of the technology, suggests that this form of interactive teaching and learning may prove a cost-effective addition to, and in some cases a substitute for, current educational strategies and practices. The potential applications below have positive implications for the quality of teaching and learning and for the provision of improved and more equitable educational opportunities.

Potential educational applications identified to date include: expansion of curriculum offerings, particularly to smaller and more isolated schools; the provision of 'key' lessons to multiple and/or remote sites; enhancement of educational offerings and quality for home-based learners; establishment of enrichment and assistance programs, including a 'homework channel'; improved professional development and communication for teachers, and among teachers and the community.

A REPORT ON THE EFFECTIVENESS AND POTENTIAL OF AN INTERACTIVE VIDEO TEACHING TRIAL

THE TRIAL

The trial was conducted by the Open Access Support Centre of the Queensland Department of Education in conjunction with the Capricornia Region of the Department of Education and with the support of the Central Queensland Amateur Radio Operators' Association.

The interactive video technology is based on an extensive and expanding Canadian project coordinated by Wayne Warren of the Model Informatics Learning Centre of the St. James-Assiniboia School Division #2 in Manitoba. Based on the Manitoba model, equipment for the present trial was built and operated by Bob Godfrey and Brian Berry for the Open Access Support Centre. Alan Parr, Educational Adviser - Technology, Capricornia Region of the Department of Education, acted as coordinator of the trial. [Reactions to the trial and the draft version of this report from Wayne Warren, Bob Godfrey and Alan Parr, are contained in Appendices B, C and D.]

Defining and distinctive characteristics of the technology include its use of amateur service frequencies for transmission. This has very substantial cost savings, both in equipment and transmission, compared with alternative interactive systems such as compressed video. The principal limitation of the technology is its restricted range, some 50-150km depending on topography, although this can be extended through use of repeaters. It is also necessary for those operating the system to have a Limited Amateur Operator's Certificate of Proficiency.

The trial aimed to provide a preliminary assessment of the feasibility and potential of interactive video technology for teaching and learning. Less directly, the trial also investigated other potential uses such as for professional development programs and provision of 'key lessons' to isolated areas.

The trial involved two lessons:

(i) A French lesson taught to a class of Year 7 students at a primary school in Rockhampton. This lesson employed two way video and audio: both teacher and students could see and hear each other.

(ii) A Japanese lesson taught simultaneously to three classes of Year 7 students at three Rockhampton primary schools. This lesson employed one way video and two way audio: the classes could

see the teacher, but the teacher received only audio from the classes.

Neither of the two teachers had used interactive video previously, although both had experience with audio teleconferences. The teachers were briefed on the technology but were not trained in its use.

The content of both lessons was mainly revision of material previously covered rather than presentation of new material. Each lesson was scheduled to last 30 minutes, although the Japanese lesson went some 10 minutes longer.

Lessons were taught from a temporary studio in a former school in central Rockhampton. Two cameras were used: one focussed upon the teacher; the second was mainly used for close-ups of visual aids. The cameras could be used to zoom in and out, to pan the room, and so on. In the French lesson (two way video and audio), the teacher saw two monitors: the first showed the picture being received at the school and seen by the students; the second showed the actual school classroom. In the Japanese lesson (one way video and two way audio) the teacher saw one monitor showing the picture being received by the three classes and listened to an audio speaker from the students.

The actual trial differed in some respects from the intended format. It had been an intention to include four schools outside Rockhampton through the use of a repeater station on Mount Archer. This was abandoned because the broadcast frequency was found to interfere with the local ambulance service radio (this problem could have been overcome with more time). One consequence of this was that the three schools participating in the Japanese lesson were included with little notice. In turn, this led to some compromises with equipment, such as use of speaker phones for audio in some classes and smaller monitors than intended.

The experimental nature of the trial resulted in several constraints for the teachers. The studio was fairly crowded, with up to 15 observers present and with movement in and out of the studio during the two lessons. Local television news services filmed part of a lesson and this created noise and excessive movement around the studio. Overall, the teaching situation was far more difficult and potentially distracting than would normally be anticipated.

THE EVALUATION

This report is based on interviews with participants and observation of the interactive video trial conducted in Rockhampton on 20 March 1992. Data were gathered by seven staff members of the School of Education at the University of Central Queensland. The project was undertaken through the University's Research Centre for Open and Distance Learning.

Interview data were gathered using a semi-structured interview schedule (see appendix A). Interviews were held with:

The Japanese and French teachers conducting the lessons.
Teachers and students in each of the five participating schools.
The Executive Director and other staff of the Capricornia Region of the Queensland Department of Education.
Representatives of the Queensland Open Access Support Centre and of the Priority Country Area Program.

Although data gathering for this report adopted a systematic approach, some cautions need to be expressed regarding the 'evaluation': (i) it was not possible to interview all interested parties and participants; (ii) for the most part, those present at the trial could be expected to be pre-disposed towards the technology and its potential; (iii) data were obtained at the time of the trial and thus reflect immediate impact; (iv) responses may well have been influenced by the novelty of this particular innovation (some student data, for example, clearly reflect the excitement of "something different"). The various extracts from interviews and observation notes which are presented below should be seen as indicative of a set of perspectives on the trial and its potential rather than as representing the results of a comprehensive and balanced evaluation. In addition, as noted above, Appendices B, C, and D contain responses to the draft version of this evaluation report from key persons associated with the technology and its use in this trial.

REACTIONS TO THE TRIAL

At the studio

Overall reactions to the trial were very positive. Areas of criticism tended to address minor or logistical issues rather than the technology and its usefulness.

Comments from the teachers

Both teachers responded positively to the trial. They felt that further trials should be conducted and indicated their own willingness to participate.

The teachers regarded the two-way video and audio interactive technology (the French lesson) as more effective than one-way vision and two-way sound (the Japanese lesson).

With respect to the two-way video and audio French lesson, teacher comments included:

Children's responses were very similar to a normal class.
The lesson achieved its aims "completely". "Very happy ... covered everything ... surprised and delighted with the interaction".

Picture quality regarded as "excellent". Students were seen clearly and facial expressions visible.

Sound "quite good" - but room for microphone improvement.

"Fabulous that children have this opportunity, ...promotes equality of educational opportunity for all children and overcomes problems of teleconferencing."

The technology has the "potential for use at any level - Years 1-12, in LOTE and other specialist subjects, for disabled teachers, in distance education". [It would be] "very good for teacher education seminars and conferences".

A permanent studio would be preferred. A professional development and training program is needed for teachers to use the technology, [then] "you wouldn't even need a technician".

The trial restricted movements considerably - "I would not normally sit down so much during a lesson".

"To me it was like taking a French lesson sky diving...It was fun...It was different".

Teacher comments on the Japanese lesson are listed below. It should be noted that this lesson not only lacked two-way vision (the picture being sent to the schools but not relayed to the teacher in the studio), but the lesson was being conducted simultaneously in three classrooms. In effect, the teacher was undertaking a multi-point teaching teleconference while being on camera to students and with the need to present visual aids.

The lesson was a significant "enhancement of current teleconferencing practices". The ability to show visual aids was regarded as a major improvement over the use of Fax in teleconferences. At the same time, one-way vision means that the teacher still "can't see if they are understanding".

While the lesson was regarded as successful, the demands on the teacher were substantial. "Need to think of many things at once, ... need to be ultra-prepared" as a result of conducting a mix of teleconference and videoconference.

The potential effectiveness of this technology was regarded as linked to particular content areas and pedagogies. "One-way [vision] may be alright for grammar-based lessons, but teaching communicatively requires that the teacher receives context cues [as in two-way vision]."

With respect to teachers using the technology, a "major program would be required - technical skills, camera presentation, and so on".

<u>Comments from observers in the studio</u>

It was more than I expected - I have been to previous trials and seen what $100,000 can do, but this provides comparable results at much lower cost.

Uniformly, observers in the studio were positive in their reactions to the trial and its potential. Both lessons were seen as largely successful in achieving their intentions, although the two-way video was seen as significantly superior to one-way for maximising potential teaching and learning quality. For example, frequent mention was made of the effectiveness with which the French teacher was able to visually demonstrate and respond to lip formation for pronunciation skills, while this was not of course possible in the Japanese lesson.

It should also be noted that both teachers were regarded by observers as particularly competent. For example, one observer commented, "This teacher seems to have a natural affinity with this technology and I believe is a gifted language teacher. I am not sure about other teachers being so successful". As indicated elsewhere, an effective training program was regarded as crucial to successful implementation of the technology on a wider scale.

Observers noted some problematic areas, but these were not seen as over-shadowing the potential of the technology.

> Only problem was that there was no movement - some teachers like to walk up and down. However, in other trials I have seen, teachers eventually changed their teaching style to cope with sitting in a fixed position.
>
> Handing around the microphone was ridiculous. Dick Smith has lapel microphones which are cheap and easy.
>
> Perhaps a control panel is needed for teachers to gain greater control over the camera on them and that on the children.

At the classrooms

Students

In all cases, observers reported a positive reaction to the trial from the participating students. As noted earlier, however, the novelty aspect of the trial undoubtedly contributed to this reaction. The fact that local television stations, for example, filmed segments for the evening news created excitement and comment which affected attitudes towards the trial. One observer reported that when asked whether they had enjoyed the trial, students responded very favourably with replies including, "It was fun", "I liked the lolly" [distributed by the class teacher to keep students occupied during a delay before the broadcast began].

Consequently it is important to place student response within context. This context suggests the trial demonstrated that the technology *can* work well for students. However, a more normalised and routine use of the technology may well reveal constraints and difficulties not apparent from this trial.

The reports of observers at classrooms included the following:

> The students had nothing but positive comments to make concerning the trial. They responded that it was "excellent" and the time went really quickly. They found the teacher did have problems hearing them at times. They were able to copy what the teacher was saying and they thought they would be able to learn from a television lesson like this. Students would prefer the teacher having only one school at a time, "so you didn't get embarrassed about asking a question". They felt a need to meet the teacher and have periodic face to face contact. [Japanese lesson]
>
> Favourable comments included: "It was excellent"; "I wasn't nervous"; "Seeing our teacher on camera"; "It was good because it wasn't normal"; "I enjoyed the whole thing because it was different"; "it was like the game 'Nightmare', where you have to talk to the television". [French lesson]
>
> They would prefer having a camera on them so the teacher could see them. This was because they could then be spoken to about "how" they were saying the words. [Japanese lesson]
>
> Asked to explain why they were so favourable towards the trial, one group of students said learning would be better because you have to take the responsibility to pay attention and learn. [Japanese lesson]
>
> The principal student criticism related to the microphone which needed to be handed around. Only a small group could participate, with six being about the maximum. Students also disliked having to lean over to talk into the speaker microphone. [both lessons]
>
> Student suggestions for a future trial included using a larger classroom, using a moveable camera, and using a fixed microphone.
>
> Disadvantages cited included the time taken in setting up the equipment, problems experienced in interpreting the teacher's instructions and speech, and not having individual help and feedback. There were two dimensions to the last point. The first was to do with the teacher diagnosing problems, supervising work so that errors were caught early and individuals given prompt attention. The second related to being corrected publicly instead of privately, with consequent embarrassment. [French lesson]

Although students were favourable in response to the trial, it is also apparent from the comments below that face to face lessons were perceived as having some significant, and predictable, advantages.

When asked whether they preferred normal face to face Japanese lessons with their teacher or learning using the television and audio approach, all but one student preferred face to face teaching and the remaining student said that he didn't mind "either way". Student comments to explain this preference included, "[The usual teacher] explains it better", "She's there to help you...She waits for you", and "You can't understand it properly [on television]".

At another classroom, critical comments included: "The teacher wasn't here to go around and check our work. We had to do a lot of it ourselves"; "It's better when the teacher's here...You don't want to give us a half hour lecture in front of other schools". Other comments included the need for students to "think more" because the teacher was not present in the room to help them.

Asked whether they felt that it would be better for students in an isolated school to have a second language teacher visit them once every three or four weeks or for them to have a television lesson once a week, almost all students nominated a weekly television lesson.

Comments from teachers observing at the classrooms

At least one teacher was present in each classroom during the lessons. As with other observers of the trial, reactions were generally favourable.

The trial achieved what it had intended to. The students were motivated by the video presentation and were not inhibited to talk into the conference telephone once the lesson was under way.

Pleased with the picture quality but disappointed with the audio quality.

The lesson was enjoyable, there was good student participation, and the technology held their attention.

It didn't really teach Japanese because the students already know the content. It did give them practice, the students did enjoy it, but not really sure how soon the novelty will wear off.

Expected the trial to be successful and thought it had been. Happy with the way the class responded, particularly in a few difficult spots. I think it shows that with the available technology, schools in the outlying districts can come on stream and have quality LOTE material. The quality of picture and sound were good.

The trial achieved its presumed objective of looking at the provision of technology in remote areas.

I found today's trial relatively stressful because I am not technology oriented and because of the late notice for involvement. I am concerned that students had to answer questions quickly and had no time to think clearly, a factor which takes away their success and self-esteem.

Comments from other observers

Each of the seven staff of the School of Education at the University of Central Queensland who observed and obtained data for this report also provided their own commentary on the trial. A number of these reactions is reported below.

> The quality of video was similar to the normal commercial TV. The sound was very poor. It was far from ideal that the students sat on chairs and leaned down to talk into a telephone on the floor. If they had been expected to have been involved in a writing activity, it would have been difficult if not impossible.
>
> My impression of the trial was favourable overall. I was impressed by the split image technology which was demonstrated. I felt that a lesson taught by someone from a remote location must inevitably suffer some loss in rapport and interactive warmth with students. I wondered also whether this type of technology allows higher level learning in language acquisition (such as responding to text or engaging in conversation) as easily as it does a relatively basic concept (such as number). Another concern was the potential for regimentation of learning and centralisation of pedagogical control attendant upon a central control site being used to broadcast to a number of isolated schools (in other words, at 12 o'clock on Tuesday every school in the cluster must be at precisely the same point in the program, and furthermore schools would all have to follow the same program).
>
> During the lesson, a problem which emerged was that the children could not always see the teacher. When she gave instructions regarding the charts, the chart appeared on the monitor. However, when the teacher spoke, non-verbal signals were no longer available. This made comprehension more difficult, and was also a problem for children who needed cues about mouth shape when repeating words. The problem was rectified to a small extent later in the lesson, when the studio operator used windowing to try to show both chart and the teacher. However, the image of the teacher was necessarily small so the chart could still be seen. Consequently, non-verbals were still largely unavailable, given the small monitor.
>
> It also appeared that it was not easy for the teacher to diagnose problems the children were experiencing. Sometimes the children were at a loss as to what they were to do, and this did not seem to be

immediately apparent to the teacher. The local teacher and the subject master both intervened several times, off camera, and in a quiet way, to give the children hints as to what to do, and to help when they were stuck. For example, the subject master wrote the homework numbers on the chalkboard. These actions may well have been related to the "showcase" nature of the trial.

The lesson appeared to be mainly a review and extension of homework exercises the children had done. The lesson was therefore structured and predictable.

It would appear to be possible for a local teacher to be trained in setting up and operating the equipment, and then monitor the lesson as it progressed. However, I suspect pre-lesson setting up would be quite time-consuming.

A special area might be needed (e.g. carpets, sound-absorbing drapes) even for audio return only. The restricted camera field of view was a problem, and concern was expressed about using larger classes, particular with a camera. For audio only, larger classes could be used.

TRAINING AND PREPARATION NEEDS

The need for some form of orientation and training program for participants in interactive video teaching and learning situations was frequently mentioned. While this need was primarily addressed to coping with demands placed on teachers, several people also noted a need to help students to develop effective learning and interaction strategies. If the technology is to be used as a community resource and as a vehicle for communication between schools and communities, as was advocated by some participants, there are also orientation and training implications for parents and other community members. Reference to training needs has been made elsewhere in this report; additional specific comments are noted below.

> You can't just dump technology on people who aren't technocrats. The technology should be further developed with the teacher in mind, not just technical people. The technology should be user-friendly.

> Once the "how to" is achieved there wouldn't be any worry. Really a student could be responsible for the hook-up. The biggest demand is the need for teachers to teach children how to use this mode to learn from. It is more than watching TV like they do at home.

> The presenting teacher would need training with television skills (such as diction, speed of speech and facial expression).

Training needs are minimal for the teacher and group of students to use the technology.

Students need to be taught how to watch TV, to learn from it. There has to be more involved than just watching the TV like they do at home.

The presenter must be trained in two respects: in his/her self; and in teaching strategies.

It must be kept simple - it needs to be locally 'owned' as much as possible.

POTENTIAL

Notwithstanding various criticisms and suggestions for change noted in other sections of this report, responses to the interview question "Do you think this sort of technology has potential for use in education?" was uniformly affirmative. The trial clearly stimulated ideas for a range of teaching and learning, and community and professional development activities.

Limitless. Would be best with Year 3 and up, although Year 1 would cope with language taught at this level.

No restrictions as to content, though physical education may be different. Would be great for instrumental music - more teachers may be willing to be involved when travelling great distances isn't required.

With languages, nothing beats face to face teaching - but if this is impossible then this is great, 1000% better than audio or teleconference.

Potential uses could be in Priority Country Area Program, distance education, rural education, Aboriginal and Islander education.

Further trials could be used with rural education. The focus needs to be on children not having to move away from home. Further trials could involve home based learners, high-top schools, and using academic and vocational subjects.

Has real potential for team teaching. But the LOTE teacher must visit the children at least once a semester.

Small towns are extremely used to using the UHF band so would easily cope with this technology.

Use in education for the gifted and talented would be excellent (these students are usually motivated and do not need constant supervision). The number needs to be kept small in terms of student use.

In the teaching of language it is excellent because of the immediate feedback the students receive.

Use in meetings would be excellent - having someone to look at would be preferred to the 'disembodied voice' now happening in teleconferences.

In-service would be excellent also in this mode - you could see what was being referred to without having to go great distances to attend.

This technology has potential in:

- teaching at all levels and most subject areas
- meetings
- professional development, especially for inservicing teachers from small schools.

Potential applications are in at least five areas:

1. Offering new subjects, for example, Ancient history in a small high school.
2. Enhancing current subjects, including those where it is difficult to get highly qualified teachers or where teachers may be inexperienced - offer a periodic 'key' lesson. Could be used to provide extra demonstration material such as science and computing in primary school, or physics and maths in secondary.
3. In-service for parents and teachers.
4. 'Homework' channel for home-based learners which would also provide a link with parents.
5. Provision of 'catch-up' lessons.

Although the above comments illustrate some considerable enthusiasm for the potential of the technology, it should be born in mind that many of the same people also drew attention to certain limitations and caveats. These are illustrated in the next section of this report and by the following guarded response:

> It's not a patch on classroom teaching...You're lacking in the humanness. It's hard to get a rapport with a TV set. Language is basically interaction between two people. [Nevertheless] the technology is better than nothing in a small school without access to a LOTE teacher.

AREAS OF CONCERN AND FURTHER INVESTIGATION

Teachers and observers did raise a substantial number of reservations, cautions and suggestions as a result of the trial. Their comments are reported in full in this section since they are important areas for consideration and investigation in future trials or implementation decisions. As the literature on educational change has amply demonstrated, the potential for successful implementation of new technologies will be conditioned as much by the attitudes and perceptions of those to be affected as by the 'objective' appraisal of the technology and its application.

> Because the children were familiar with the work, they found it easy. I would be concerned about the effectiveness of the lesson if it had covered new work.
>
> Students need to be taught how to watch TV, to learn from it. There has to be more involved than just watching the TV like they do at home.
>
> The lesson was satisfactory. However, there would need to be face to face contact so students could get to know teachers and their expectations and teachers could get to know the capabilities of the students.
>
> The quality of the picture was excellent. The sound was the biggest problem - coming over a teleconference line it was slightly distorted. It would have been preferable for sound to be channelled through the television, because too much static and interference came from the telephone.
>
> Overall, the lesson was not up to the academic level of the six students who participated. The way it was done this time limits the number of children able to be involved due to the microphone situation. The more aggressive students answered first while the less confident were quiet for fear of getting the answer wrong. The teacher had no way of monitoring who was/was not participating in the lesson.
>
> The biggest problem with the trial was that it tied up for one and half hours the only telephone line into the school. There was a child injured and there was no way to call out.
>
> There is a need for contact before use so that hands on activities can be used and the learning does not become totally passive.
>
> One consideration for future use would be the furniture and its set-up. For the trial there was much shuffling to allow students to have access to the microphone.

It would probably work very well in an ideal situation where the technology was a permanent feature and not installed the previous evening. Since the students had prior knowledge of the topic of the lesson, a more realistic trial would result from presenting material which was new to all students in the trial.

I found that the kids, at times they might have been a bit puzzled, but they did listen. They were very attentive for the period. Possibly with the attention span needed, they might need to have a bit of a relax afterwards, to do something a little less demanding on them because it is fairly intensive. But I think that is probably as it should be, because its got to be quality time.

Setting up initially was time consuming but expect that to be simple once equipment and procedures were established.

The classroom teacher should be given the flashcards and lesson information beforehand, and could then work cooperatively with the TV teacher.

It would be unfair to base all comments, whether favourable or unfavourable, on a single trial. There is a definite need for further trials. I'd hate to recommend this equipment purely on today. A new trial would need to involve a topic which is new to all students.

The [Japanese] lesson made learning too competitive. Students had said "[our school] came last" at the end of the lesson. This conflicted with the school's philosophy, which is to promote co-operation rather than competition in learning.

Suggestions for variations on today's trial: involve schools whose present experience of LOTE is restricted to teleconferences; have the teacher (Japanese) give a lesson to a single school to remove the element of competition with other schools.

There are pre-requisites for the successful implementation of the new technology. The first is for the Department of Education to guarantee that no cost would be incurred by the communities using the technology. The second is for staff at transmitting and receiving schools to be released for a week, so that they could go into a television studio and be trained "on the spot". A lot of public relations work will be needed with parents in remote communities - suggest the provision of TRS days at Department of Education expense for both teachers and parents to be involved in training and examining the technology.

APPENDIX A

INTERACTIVE VIDEO TRIAL: INTERVIEW SCHEDULE

Broad introductory question along lines of: Taken overall, what was your reaction to today's trial? [Note: for Reanie Street interviews, need to distinguish reactions between the two trials during the interview.]

General reaction to the trial:

Was it what you expected? Why or why not?

Do you think the trial achieved what it set out to do? (In what ways?)

How adequate were:

Quality of picture?
Quality of sound?
Switching between sites (if applicable)?

Taken overall, were today's lessons satisfactory (learning and teaching, comfort etc.) from the point of view of the teacher(s) and the students.

Potential:

Do you think this sort of technology has potential for use in education? For example,

- in teaching
  at what level? in what contexts?
- for holding meetings, e.g. ...
- for professional development purposes, e.g. ...
- other?

With specific reference to the content area of today's trial, do you see this sort of technology as appropriate to the teaching of languages? Are there any particular advantages or difficulties in teaching language in this way? Would you like to see further exploration of interactive video for the teaching languages?

Judging from today's trial, are there changes or improvements which would benefit future use of the technology?

Training:

If this sort of technology were to be more widely used, do you think there would be additional demands placed upon teachers and/or students? If so, what?

Would there be a need for orientation courses or some sort of special training for people using this technology? If so, what?

Would you be willing to be involved again in a trial such as this one? If another trial, or series of trials, were to be held, can you suggest any changes (for example, to the format or who should be involved) which would help explore further the potential of this sort of technology?

Are there any further comments which you would like to make on this trial or the technology and its possible applications?

APPENDIX B:

[As noted in the body of this report, Wayne Warren is the principal developer of the technology used in this trial. His comments on the draft report are reproduced below and are followed by a later set of comments provided after viewing a videotape of the trial.]

MEMO: **Followup '92 May 06**

TO: **Dr Robert Baker, University of Central Queensland**

FROM: **Wayne Warren, Informatics Co-ordinator, St James-Assiniboia School Division #2, Manitoba**

SUBJECT: **Comments on your recent tele-teaching preliminary report**

Bob Godfrey has FAXed to me a copy of your research paper entitled "A Report on the Effectiveness and Potential of an Interactive Video Teaching Trial". At the outset I must compliment you and your team on a revealing and very useful report. I've read it with considerable pleasure at the commonality of interest that is being established between our two jurisdictions. With your permission, I would like to share copies of your report with my colleagues here in Canada.

Before I comment directly on your report, you may be interested in this update on the Manitoba situation:

(a) My own school division is expanding its current tele-teaching facilities to provide an additional course next semester, Advanced Placement History. It joins AP Biology and Informatics as senior high school offerings across our network. Our interactive network will be further upgraded to enhance picture and sound quality.

(b) A neighbouring school division, with a scattered and ethnically-mixed population, has just decided to implement a full-scale three-site tele-teaching system using the technological, teacher-training and curriculum development package I have recommended for use in Queensland. Orders will be placed shortly and full implementation is planned for 1992 September. Among other subjects planned are Informatics-205 (in English) plus Mathematics-105 and Science-105 (both to be taught en français).

(c) I made a full-scale presentation last week to a group of French Immersion High School Principals. Several of them will implement our interactive system within the next year to accommodate a growing problem of instruction, en français, to small groups of top students in small, adjacent schools.

(d) Enhancements to the existing systems will increase the maximum range paths between distant schools, using FM video-modulation and horizontal polarization of antennas plus more effective omni-directional microphones in classrooms. More on this upgrade in my comments on your report.

(e) New projects in Manitoba, from 1990 onward, now include provision for adequate time, budget and curriculum to train teachers in how to use the technology and how to become effective tele-teachers. This support typically extends over two years.

Page 2, comments -->

The Queensland report on two tele-teaching trials during March of 1992 is an accurate reflection of the state of the art in interactive, wireless tele-teaching. Staff from the Capricornia Region of the Queensland Department of Education and from the Open Access Support Centre wisely chose two lessons that require and demonstrate extensive teacher-student interaction, both verbal and visual. The prototype equipment used was both appropriate and effective and it reflects well on the technological expertise of the technical support team and on experimental use of the Amateur Radio service.

As principal developer of this technolgy's use in Canadian schools, I compliment all parties for the effort and results described in "A Report on the Effectiveness and Potential of an Interactive Video Teaching Trial". Additional comments:

(a) Year 7 students (our Grade 7 Junior High School equivalent) are typically over-active and somewhat difficult to teach in terms of attention span, general classroom discipline, and interest in academic subjects. During your French and Japanese demonstration lessons, your teachers obviously had their students well in hand and were able to teach effectively. For many years, I have noted and reported on the "discipline effect" that interactive teaching can bring to schools. Your results support that phenomena. In my circumstances, students maintain learners' discipline over long periods, not just for the short time of a demo lesson. We can predict that the novelty will wear off in a few days or weeks but that the learning discipline will persist over long periods.

(b) Comparisons of two-way video-two-way audio (called duplex video/duplex audio) to one-way video and two-way audio (called simplex video/duplex audio) have been made in Manitoba on several occasions. All observers agree that the former is preferred when budgets and available equipment permits. However, that agreement weakens depending on the nature of the lessons taught and of the students involved. Language teaching does require that the teacher observe lip-forms and be able to hear/react to mispronunciations. That need is less evident during a senior high history lesson, when eye contact and verbal cues are not so vital. Nor is that intensity of interaction always needed during hands-on activity, such as remotely managing use of a computer or videography lab. All interactive systems should plan for both forms of pedagogy and teachers need to know how to and when to use each method. Full-duplex systems are easily managed for links comprising only two schools but full-duplex becomes more complicated and expensive for three-or-more school systems. By having both options available, teachers quickly learn which to use for each application. I use full duplex for about 25% of my work and simplex mode for most of the rest of my interactive tele-teaching.

(c) No other form of interactive "tele-teaching" provides the degree of interactivity you noted at such low cost. In North America there is considerable interest in using "optical fibre" and "microwave" systems. In every such case, the costs and bureaucracy needed are beyond the capacity of most schools and occur only where some external agency agrees to heavily subsidize the school users. For many years, I personally managed both a microwave (ITFS band) and cable distribution system for our schools. Even though we did most of the work ourselves and even though we owned and operated the entire system, microwave and cable delivery was far more costly and far less interactive than what you have demonstrated. It should be acknowledged that many of the major advances in telecommunications first emerged within the Amateur Radio experimental service and our projects are clear evidence of that trend accelerating.

(d) Teacher-training and local "ownership" of both technology and the curriculum delivery are absolutely essential. Our best tele-teaching projects are those which adhere to that principle. Our only failures are those where local leadership failed to emerge. For that reason, I have recommended thorough training for any on-going Queensland project with support stretching across at least one full year and preferably two years. The greatest gains occur when teachers' tele-teaching training spans two full school years. It takes time to "digest" all the technology

and changing pedagogical styles. By having several senior students enrolled in such a training course, they become very valuable assistants to the on-camera teacher during their years in a participating school.

(e) "Homework channels" are popular and we have one delivered by an urban cable-TV system in Winnipeg. It is successful and uses some of my earlier microwave equipment as a link from "studio" to cable TV headend. However, that service does not reach remote sites. I am about to implement a small-scale interactive, tele-teaching homework network where the "teachers" are distributed across the region and where the students are both in-school and out-of-school learners. We have a significant number of "illiterate adults" in Manitoba and I hope to reach some of them via this methodology, since most of them possess TV receivers. Also, with the rapid advent of video, computing and other Informatics systems, there is an endless demand for "remotely-delivered" training and consultation for the end-user. We are now able to address some of those needs directly by our "ATV network". One fascinating effect of our tele-teaching experience is that young students can and do become teacher-proctors to older students and adults ... and this "turns the tables" on the usual pedagogical practice, with impressive results.

(f) Technological advances in use of the Amateur Radio Service for interactive video and audio are occurring very rapidly. I have a recent report on one such system, using radio-frequency links across a zone of more than 400 kilometres. While it is not intended for classroom applications, that technology is easily absorbed into our projects. Also, in your report there were comments on inadequate voice pickup by the classroom participants. That deficiency is easily remedied by using three-channel wireless microphones by the teacher, teaching assistant and one other person plus a omnidirectional, ceiling-suspended flat surface mic. which is sensitive to sound from anywhere in a typical classroom. I have found that telephone-based teleconferencing units are satisfactory for small groups but inadequate for larger groups and often involve unacceptable cost and bureaucracy. The aim of all interactive teaching systems should be to make the technology "transparent to the audience" with minimum intervention by either teacher or student. We've achieved that to a large extent during recent tele-course deliveries in Manitoba.

(g) Factors such as commonality of class timetables and "classroom monitoring for discipline control" will emerge in any Queensland trials. There are solutions to both which I can elaborate later. In the senior high, common timetables are emerging here for the afternoon "slots" and "educational assistants under the tele-teacher's supervision" provide the legal requirement for monitoring of in-school students.

(h) The students' need to see the teacher and the close-up material is often best met by having a simple, mechanical switch available to the teacher. With it, he or she can decide which of two cameras is on-line to the transmitter. Also, the teacher's TV monitor should be equipped with a remote control so she/he can switch between various inputs to confirm that the best "shot" is being transmitted. These and a myriad of other factors will be resolved during any lengthy trial and I am prepared to provide direct support of any such enhancements as your proposed trials are implemented.

Again, my compliments and best wishes for successful field trials.

Regards

Wayne Warren, Informatics Co-ordinator

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Additional Comments on "A Report on the Effectiveness and Potential of an Interactive Video Teaching Trial, Rockhampton, Queensland - March, 1992"

Comments arising from viewing a videotape of the Rockhampton French lesson and from further developments here in Manitoba:

(a) The Français teacher in Rockhampton did an admirable and effective job of using an interactive TV and voice system. I agree with UCQ observers' remarks on the apparent effectiveness of the medium and the quality of teaching that occurred under those ad hoc circumstances in March. Given more preparation time and a bit more radio and microphone equipment, the students' verbal responses would have been more spontaneous and the interaction even more impressive. We use wireless microphones for teacher's outgoing audio and large area flat-surface mics. (inexpensive Tandy/Radio Shack items) for remote student response via the continuous voice radio links or as companion to the switched-video link. This permits both teacher and students to move about the classroom and comes close to simulating normal classroom functions.

(b) By operating in full-duplex mode, the Français teacher was able to control the learning experience to good effect. For example she could see and admonish a student to wait his turn during questions and answers about weather conditions in France. This is typical of an accomplished teacher and typical of the interaction occurring in a physical classroom. I have often used similar techniques but, since my students are older and very comfortable with interactive media, I seldom have to depend on full-duplex video for effective teaching. By having immediate-response audio (separate from the audio accompanying the teacher's video) my students can query me at any point during a lesson. With older students (grade 12s now called Senior Level 4) I can usually depend on the natural discipline of the interactive medium to keep learning on track during a tele-lesson.

(c) I noted the somewhat formal seating arrangement of the Rockhampton students. By appointing one of them as camera-operator, the "tele-teacher" could direct less formal groupings, could initiate chalkboard work, could manage small-group activities and so on. Another phenomenon I've observed is that the "camera-operator" seems to be more focussed on the lesson content and learns every bit as well as the other students. By rotating camera operating duties, no student is disadvantaged and all students earn their reward of being camera-operator-for-the-day. Note that all students acquire significant technical skills by this integration process. Depth of focus, correct lighting, macro-photography, adequate sound pickup and other useful refinements just naturally emerge.

(d) In a full-scale Queensland field trial, it would be pedagogically important to have FAX mode available for teacher-student paper dialogue. This can be achieved by using wired telephone FAXes or, with a bit of effort, wireless packet-radio FAXing. Also, it would be a real asset to have an easily-used microcomputer (example the Macintosh Classic 4/80, current educational price roughly $Cdn 1,000) available at both the teacher's and the students' ends of the link. The Mac is a powerful language-instruction tool, since it so readily lends itself to Français or Japanese script fonts. We use them widely in our system, with Mac computers available at most tele-teaching stations. I have developed our entire Informatics curriculum (student and teacher materials) as a series of Macintosh-format desktop published documents. By doing so, I can support remote teachers easily by mailing diskettes of lessons, by FAXing directly from the Mac to the remote FAX machine, by using packet-radio wireless email to/from teachers and students and so on. The Mac, equipped with a dual-mode FAX and ASCII modem, permits FAXing to/from common FAX machines and between any other two computers with FAX modems. Any teacher with the competence of the Français teacher used for the Rockhampton tele-lessons can master the Macintosh as a tele-teaching tool.

(e) Small, rural schools often face a problem of finding enough space to accommodate a tele-teaching workstation. We've successfully used standalone room dividers in an existing classroom or computer lab to create a space roughly 5m by 5m. This small area is normally adequate to accommodate 5 to 10 students plus a supervising teaching assistant and does not add much cost to the project. During a tele-lesson, the room's usual teacher is normally in charge of the sub-group participating in the tele-lesson and the larger group going about its routine lesson. Also, by establishing afternoon common timetable slots (example - the last two periods of the day), we've been able to accommodate students in several schools without creating lock-step time-tables across all schools.

(f) Bob's tape included news coverage of the Rockhampton trials. Your State Minister of Education was quoted as anticipating significant cost benefits and that is quite accurate. In our experience, a complete tele-teaching system including extensive teacher-training and on-going support costs less than $Cdn 10,000 per school. That is one-time cost with very little future cost, other than occasional equipment repair or upgrade. Your Minister also mentioned that the quality of education can improve markedly for small, remote schools and that is equally true. One concern that will emerge is how to retain skills in a school where teacher turnover may be quite large. There are several strategies. One is to make certain that at least two teachers are initially trained for tele-teaching projects. Another is to include a few capable students as "operator trainees" who can provide useful classroom support at all ends of the link between two or more schools. A third strategy is to include local Radio Amateurs as volunteer sponsors of their community school.

(g) Radio Amateurs in Australia have a long, proud history of telecommunications innovations and public service. By "plugging in" at least one volunteer per project school, the school earns a valuable ally and acquires an essential technical assistant when occasional repairs or adjustments are needed. In Manitoba, I've made a point of using local volunteers wherever they exist. It has become something of a feather in their cap to be considered the resident ATV expert. And to not include these licenced volunteers would be counterproductive, since a few may feel that schools are interlopers in a domain long used only for personal experimentation. In an earlier mailing to Glen Postle, I included a copy of a 1992 communiqué from the regional office of our Department of Communications ... basically supporting distance education projects but laying out ground rules for school use of the Amateur Radio spectrum. This is an extremely important precedent and bodes well for future co-operation between the experimental community and educational use of the spectrum. Ironically, schools are now funding innovations in the upper UHF radio spectrum that few if any licenced experimenters have been able to explore. This is absolutely to the benefit of both groups. By being able to use the interactive facilities (repeaters, links and so on) after school hours, Radio Amateurs can now conduct valuable experiments, peer-group training and so on. By working with Radio Amateurs, schools are now able to use interactive media at surprisingly low cost per tele-teaching workstation.

(h) It would be a wise investment to develop an Educational Informatics course for use by students in the UCQ Faculty of Education. By doing so over a period of years you would acquire a small pool of talent which would work its way into Queensland schools and would serve to accelerate more and better use of this tele-teaching technology. In the context of Canadian and Australian educational realities, such courses are long overdue. I would be delighted to assist development of such a program of studies.

For your information, we are accelerating implementation of a five-school Français and Advanced Placement network which includes which includes two small rural schools and three medium to large schools in Winnipeg. Our expanded system has some features of possible interest to you:

(a) Two schools will be lesson-providers (St Paul's Collegiate, in Elie some 40 Kms west of Winnipeg, a small French Immersion grades 7 to 12 school which will deliver Informatics and Mathematics and St James Collegiate, a medium-sized grades urban high school which will deliver Informatics, AP Biology and AP History).

(b) Three schools will be lesson-consumers (St Laurent School, a small K-grade 12 rural school in St Laurent about 75 Kms northwest of Winnipeg; John Taylor Collegiate and Sturgeon Creek High School, large grades 10-12 urban schools in Winnipeg).

(c) This creates an interesting system for further study in that, at times, only the city schools will interact, depending on the courses taught or where the students are located. At other times only the rural schools will interact. And at still other times, all five schools may interact for special events, teacher training, etc.

(d) This expanded network will incorporate schools using both AM-modulated and FM-modulated video and we will develop techniques for merging the two technologies, so that all sites can communicate effectively. This change from AM-only video modulation is based on a small, successful FM-video trial in a nearby school district. It has considerable significance since FM-video has been demonstrated to be much more effective over long-range paths (such as those Bob has reported to me in Queensland).

(e) Note that the Advanced Placement syllabus provides University-credit for a short list of approved subjects. This has enormous implications for both schools and universities. It permits students to acquire university credits based on external, high-level exams, while remaining on the register of their local school. Also, by actively encouraging AP options, universities can reduce the huge overload that typically occurs in first year courses. By acquiring AP credits, students can reduce both the shocking burden of first year university workloads and the high cost of taking all five or more first-year courses at once. AP is becoming a popular option in Canada and the USA. We offer several AP options in our schools and have planned for more in future. Imagine the advantage to remote students who can earn such credits before leaving their local school. Introducing AP courses means that designated AP teachers need to improve their skills in such courses and that has occurred naturally here.

(f) Earlier today, our AP Biology teacher and his students completed an interactive, hands-on lab of actual genetic-engineering which was also transmitted to students across our network. Two dissimilar bacterial genes were spliced to create a new species of bacterium. That is impressive work for a high school lab and emphasizes the power of this medium to spread extraordinary learning opportunities over a dispersed population.

I hope these comments prove helpful in stimulating a full-scale, multiple-site Queensland field trial of wireless interactive tele-teaching. Don't hesitate to contact me for more information in this regard.

Wayne Warren, Winnipeg, 1992 May 13

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I believe the report on the interactive video teaching trial is a very accurate account of the days proceedings. The comments that follow have stemmed from the report and my technical involvement with the trial.

REACTIONS TO THE TRIAL

- I agree with the general statements and I am aware of the sound and microphone limitations during the trial. However these can be easily overcome.

- It should be noted that the links are not "secure" – ie. anyone with the equipment can tune to them, therefore the subject matter discussed during teacher seminars and conferences would need to be unclassified.

- I agree it is not necessary for a technician to be on site once teacher training is complete, however technical support needs to be on hand from Brisbane.

COMMENTS FROM OBSERVERS IN THE STUDIO

- The teachers involved in the trial performed extremely well even though they only had a short briefing session on the technology of the system. I believe that it is necessary to incorporate a comprehensive training program for users, to familiarise them with the technology.

- In a permanent set-up, camera control will be designed into a teacher console. This will allow the teacher to switch the appropriate vision to air.

- It is currently technologically possible for the remote classroom camera to be controlled from the teacher console. Unfortunately the budget for the trials restricted this.

- In a permanent set-up the monitor showing the remote classroom to the teacher would be better located. This would immediately improve the teacher's ability to hear the remote children.

- It is important to note, during the trial there were many additional distractions making it difficult for the teacher. These would not be present in a permanent set-up.

COMMENTS FROM TEACHERS OBSERVING AT THE CLASSROOMS

- A good quality monitor will assist in overcoming audio problems experienced in the trial.

COMMENTS FROM OTHER OBSERVERS

- Any permanent installation would have a high quality teleconferencing system with an omni-directional microphone permitting students to sit at desks around the microphone.

- The concern over the potential for regimentation of learning and centralization of pedagogical control is overcome by the fact the teacher can spend more time teaching (time is no longer lost with travel). In a permanent situation I would envisage they would only teach one class at a time.

- Large high quality monitors would allow the children to successfully see the window image.

- In a permanent situation there would be minimal set-up for the classroom teacher in the way of equipment. The equipment would be designed and installed in such a way that it would only require switching on.

- Some planning ahead of lesson content would be necessary eg. handouts would need to be delivered in advance.

- The restricted camera field of view is a problem which may be overcome by remote control, where necessary.

TRAINING AND PREPARATION NEEDS

- Through training, the technology will become user-friendly.

- The system itself is simple by its own nature, and yes, it does need to be "locally" owned so people can feel they are a part of it.

- The difficulty of trials with home based learners is restricted by licence requirements of Limited Amateur Operators Certificate of Proficiency.

AREAS OF CONCERN AND FURTHER INVESTIGATION

- In areas where there is only one phone in the school, the teaching staff must be made aware that the conference can be interrupted if the phone is required for emergency purposes. Once the use is complete, this conference link can be reconnected.

FURTHER TECHNICAL THOUGHTS

- In the event of the system being installed on a permanent basis, it would be possible for a second camera to be set over a desk so that an individual child's written work could be shown to the remote teacher in close up.

- An additional liaison VHF FM frequency on the amateur service would be used to assist with problems as they arise between the remote specialist teacher and the class teacher (this could be used by the class teacher to communicate with the remote specialist teacher, without the class being aware).

Bob Godfrey

Bob Godfrey
Open Access Support Centre

APPENDIX D:

INTERACTIVE TELEVISION TRIAL

Responses to areas of concern noted by the evaluation group of the University of Central Queensland.

By Alan Parr Educational Adviser - Technology
Department of Education
Capricornia Region.

As Regional organiser and co-ordinator of this trial I was responsible for:

. Implementing the two educational models used, namely full duplex two-way video and one-way video with audio teleconferencing.
. Communications design including the proposed repeater site and targeted schools. As has been noted this had to be redesigned at short notice due to site incompatibility problems.
. Installation of antenna systems and tuning of receiving equipment.
. Organisation of teleconference facilities.
. Administrative organisation including liaison with local Radio Amateurs.

The objectives of this initial trial were:-

* *To investigate the feasibility of using interactive television/audio as an educational medium.*

* *To investigate the practicalities of the two delivery models. Two-way television and one-way television with audio teleconference.*

* *To determine transmission paths and coverage patterns.*

* *To determine the requirements for receive facilities in schools.*

* *To determine the hardware and human resources required for such a system to be effective.*

The information and experience gained from this trial in general terms provides answers to the objectives. Other information, whilst unrelated to the objectives, gained in the course of the trial will be valuable in the design of future systems. eg compatibility with other services.

Bob Godfrey and Brian Berry are to be congratulated for their technical expertise in putting the transmitters on-air and establishing temporary studio facilities as well as thanked for the use of their personal equipment and their amateur radio licences.

The schools, teachers and students need to be commended on their willingness and co-operation especially those who had two days notice.

BEST COPY AVAILABLE

The two LOTE teachers need special mention of their professionalism and expertise in their lesson design and delivery given the short notice and unfamiliarity with the medium.

It is in the above context that I give my responses to the concerns expressed. These are numbered respectively to the report. pp13-14.

1. Familiar work vs. new work. A revision and practice lesson is a valid educational process. The implication that the lesson would not have been as effective if new work was being taught is a subjective extrapolation with no supporting evidence supplied. It may have been more effective than current practice!

2. On the contrary I think kids are good watchers of TV however the point of '...just watching...' would easily be counteracted by interactive strategies/lesson design or just good teaching techniques.

3. Face to face... There will always be a need for face to face contact for the appropriate educational reasons. Schools of Distance Education have 'Outreach', 'Inreach' days as well as school camps for this reason.

4. Audio quality: Improved microphones and audio processing will overcome this. The use of Teleconference Bridges, new phones and room arrangements will improve this. In most cases we used what was readily available in the schools.

5. A number of points which stem from the TRIAL nature of the project. The last point could also be applied to existing teleconferencing. Note that most of the students had never participated in a teleconference prior to the lesson.

6. A practical problem not anticipated. Can easily be solved using a dial-in teleconference bridge.

7. Under normal circumstances this would be a standard procedure.

8. A problem resulting from a single microphone, easily solved, audio noted above.

9. New vs familiar material again see 1 above.

10. A complementary concern? some of the positive attributes of the medium.

11. 'Setting up' was a part of the trial objectives. We all learned something.

12. Classroom teachers would normally have teaching/learning materials provided by the distant teacher.

13. It is intended to develop the trials into a working pilot project where further development will occur.

14. Competition vs co-operative learning. Teaching strategies should overcome this. What about other biases? This concern fringes on broader issues of effective teaching and quality learning. The overall rationale is the provision of an improved educational service in terms of curriculum and access.

15. Will occur in the next phase.

16. A number of concerns mainly addressed at 'System Level' support. These would be addressed in an implementation plan.

Alan Parr
Educational Adviser - Technology Capricornia Region.